WHAT IS CLAIMED IS:

1. A method for an in-service upgrade of a twin ring optical network comprising a plurality of passive add/drop nodes coupled using a first optical fiber ring and a second optical fiber ring, the method comprising:

interrupting optical traffic travelling in a first direction on the first optical fiber ring at a first interruption location between a first passive add/drop node and a second passive add/drop node, the add/drop nodes coupled to the optical rings and operable to passively add and drop traffic to and from the optical rings;

interrupting optical traffic travelling in a second disparate direction on the second optical fiber ring at a second interruption location between the first add/drop node and the second add/drop node, the first and second interruption locations proximate to one another, the network providing protection switching such that interrupting traffic flow at the first or second interruption locations does not prevent traffic on the network from reaching any add/drop node; and

inserting an optical gateway node into the network, the gateway node comprising a first transport element associated with the first fiber ring and a second transport element associated with the second fiber ring, each transport element comprising:

a demultiplexer operable to demultiplex ingress traffic into a plurality of constituent wavelengths;

a switch operable to selectively forward or terminate each wavelength; and

a multiplexer operable to multiplex the forwarded wavelengths;

wherein the gateway node is inserted into the optical ring network such that the first transport element is inserted at the first interruption location and the second transport element is inserted at the second interruption location.

2. The method of Claim 1, further comprising inserting a plurality of optical gateway nodes into the network to create a plurality of subnets, each subnet comprising a plurality of add/drop nodes, the number of subnets equal to the number of gateways in the network.

3. The method of Claim 2, wherein each gateway node is coupled to the optical rings at a boundary between neighboring subnets and is operable to selectively forward and terminate wavelengths between subnets to allow wavelength reuse in the subnets to provide protection switching.

4. The method of Claim 2, wherein each subnet has a wavelength channel capacity substantially equal to the optical network.

5. The method of Claim 1, wherein the demultiplexer and the multiplexer comprise array waveguides.

6. The method of Claim 1, wherein the switch comprises a 2x2 switch for each channel, the 2x2 switch operable to selectively add, forward, or drop the channel.

7. The method of Claim 1, wherein the add/drop nodes are operable to transmit substantially the same traffic over each of the first and second optical fiber rings.

8. The method of Claim 1, wherein each add/drop node comprises:

a first transport element operable to be coupled to the first optical ring and a second transport element operable to be coupled to the second optical ring, the first and second transport elements each comprising a first coupler, a second coupler, and a ring switch;

the first optical coupler operable to receive ingress traffic on the optical ring and to forward a first and second copy of the ingress traffic, the second copy comprising local drop traffic;

the second optical coupler operable to receive the forwarded first copy and local add traffic and further operable to passively combine the first copy and the local add traffic to generate an egress signal;

a distributing element coupled to the first optical coupler of each transport element and operable to forward the second copy to one or more appropriate clients of the add/drop node; and

a combining element coupled to the second optical coupler of each transport element and operable to receive the local add traffic from the clients and to forward the local add traffic to the second optical coupler of each transport element.

9. The method of Claim 8, wherein the distributing element comprises:

a splitter operable to make a plurality of copies of the forwarded second copy from the first optical coupler;

one or more filters each operable to receive one of the plurality of copies of the second copy and to forward one or more wavelengths of the associated copy; and

one or more optical receivers operable to receive each filtered wavelength from the one or more filters.

10. The method of Claim 8, wherein the distributing element comprises:

an amplifier coupled to the first optical coupler of each transport element and operable to amplify the second copy of the ingress traffic from each transport element;

a splitter coupled to the first optical coupler of each transport element and operable to make a plurality of copies of the forwarded second copy from the first optical coupler of each transport element;

one or more switches coupled to the first optical coupler of each transport element, each switch operable to receive a copy of each second copy from the splitter and to selectively forward a copy of the second copy from either the first or second transport element to the clients of the add/drop node;

one or more filters each operable to receive one of the plurality of copies of the second copy and to forward one or more wavelengths of the associated copy; and

one or more receivers operable to receive each filtered wavelength from the one or more filters.

11. The method of Claim 8, wherein the combining element comprises:

one or more optical senders operable to forward the received local traffic to the second optical coupler of each transport element;

a splitter operable to combine the local traffic and forward the combined local traffic to the second optical coupler of each transport element; and

an amplifier coupled to the second optical coupler of each transport element and operable to amplify the combined local traffic.

12. The method of Claim 8, wherein the combining element comprises:

one or more optical senders operable to forward the received local traffic to the second optical coupler of each transport element;

one or more switches coupled to the second optical coupler of each transport element, each switch operable to receive the local traffic and to selectively forward the local traffic to either the first or second transport element from the clients of the add/drop node;

a splitter operable to combine the local traffic and forward the combined local traffic to the second optical coupler of each transport element; and

an amplifier coupled to the second optical coupler of each transport element and operable to amplify the local traffic received from the clients of the add/drop node.

13. A method for an in-service upgrade of a twin ring optical network comprising a plurality of passive add/drop nodes coupled using a first optical fiber ring and a second optical fiber ring, the method comprising:

interrupting optical traffic travelling in a first direction on the first optical fiber ring at a first interruption location between a first passive add/drop node and a second passive add/drop node, the add/drop nodes coupled to the optical rings and operable to passively add and drop traffic to and from the optical rings;

interrupting optical traffic travelling in a second disparate direction on the second optical fiber ring at a second interruption location between the first add/drop node and the second add/drop node, the first and second interruption locations proximate to one another, the network providing protection switching such that interrupting traffic flow at the first or second interruption locations does not prevent traffic on the network from reaching any add/drop node; and

inserting an optical gateway node into the network, the gateway node comprising:

a first transport element associated with the first fiber ring;

a second transport element associated with the second fiber ring;

a first optical coupler operable to receive ingress traffic on the optical ring and to forward a first and a second copy of the ingress traffic;

a multiplexer/demultiplexer unit operable to receive the first copy of the ingress traffic from the first optical coupler, the multiplexer/demultiplexer unit comprising:

a demultiplexer operable to demultiplex the first copy of the ingress traffic into a plurality of constituent wavelengths;

a switch operable to selectively forward or terminate each wavelength; and

a multiplexer operable to multiplex the forwarded wavelengths;

a signal regeneration element operable to receive the second copy of the ingress traffic from the first optical coupler and to selectively regenerate a signal in one or more constituent wavelengths of the ingress traffic; and

a second optical coupler operable to:

receive the regenerated signals in one or more wavelengths;

receive the multiplexed forwarded wavelengths from the multiplexer; and

combine the multiplexed forwarded wavelengths with the regenerated wavelengths received from the signal regeneration element such that the combined signal is forwarded on the optical ring;

wherein the gateway node is inserted into the optical ring network such that the first transport element is inserted at the first interruption location and the second transport element is inserted at the second interruption location.

14. The method of Claim 13, wherein the signal regeneration element is further operable to convert the wavelength of one or more of the regenerated signals.

15. The method of Claim 13, wherein the signal regeneration element comprises:

a splitter operable to make a plurality of copies of the second copy received from the first optical coupler;

one or more filters each operable to receive one of the plurality of copies of the second copy and to forward one or more wavelengths of the associated copy;

one or more transponders operable to receive each filtered wavelength from the one or more filters and to regenerate the signal in that wavelength; and

a combiner operable to receive and combine the regenerated signals and to forward the combined signals to the second optical coupler.

16. The method of Claim 15, wherein one or more of the transponders are further operable to convert the wavelength of the signal associated with a filtered wavelength that is received at the transponder.

17. The method of Claim 13, wherein each wavelength that is regenerated by the signal regeneration element is terminated by the multiplexer/demultiplexer unit.

18. The method of Claim 13, wherein the signal regeneration element is further operable to drop the signal in one or more wavelengths of the second copy of the ingress traffic to one or more appropriate clients of the optical gateway node.

19. The method of Claim 13, wherein the signal regeneration element is further operable to receive add traffic from one or more appropriate clients of the optical gateway node.

20. The method of Claim 13, wherein the second optical coupler is further operable to:

receive add traffic from one or more clients of the optical gateway node; and

combine the add traffic with the multiplexed forwarded wavelengths and the regenerated wavelengths received from the signal regeneration element such that the combined signal is forwarded on the optical ring.

21. The method of Claim 13, wherein each add/drop node is operable to add and drop traffic independent of the channel spacing of the traffic.

22. The method of Claim 13, wherein the first and second transport elements each comprise a single optical coupler operable to passively add and drop traffic.

23. A method for an in-service upgrade of a twin ring optical network comprising a plurality of passive add/drop nodes coupled using a first optical fiber ring and a second optical fiber ring, the method comprising:

interrupting traffic flow on the first optical fiber ring at a first interruption location between a first passive add/drop node and a second passive add/drop node, the add drop nodes coupled to the optical rings and operable to passively add and drop traffic to and from the optical rings;

interrupting traffic flow on the second optical fiber ring at a second interruption location between the first add/drop node and the second add/drop node, the first and second interruption locations proximate to one another, the network providing protection switching such that interrupting traffic flow at the first or second interruption locations does not prevent traffic on the network from reaching any add/drop node; and

inserting an optical gateway node into the network, the gateway node comprising:

a first transport element associated with the first fiber ring; and

a second transport element associated with the second fiber ring;

wherein the gateway is inserted into the optical ring network such that the first transport element is inserted at the first interruption location and the second transport element is inserted at the second interruption location.

24. The method of Claim 23, further comprising inserting a plurality of optical gateway nodes into the network creates a plurality of subnets, each subnet comprising a plurality of the add/drop nodes, the number of subnets equal to the number of gateways in the network.

25. The method of Claim 24, wherein each gateway node is coupled to the optical rings at a boundary between neighboring subnets and is operable to selectively pass and terminate wavelengths between subnets to allow wavelength reuse in the subnets to provide protection switching.

26. The method of Claim 24, wherein each subnet has a wavelength channel capacity substantially equal to the optical network.

27. The method of Claim 23, wherein the gateway node comprises:

a demultiplexer operable to demultiplex ingress traffic into a plurality of constituent wavelengths;

a switch operable to selectively forward or terminate each wavelength; and

a multiplexer operable to multiplex the forwarded wavelengths;

28. The method of Claim 27, wherein the demultiplexer and the multiplexer comprise array waveguides.

29. The method of Claim 27, wherein the switch comprises a 2x2 switch for each channel, the 2x2 switch operable to selectively add, forward, or drop the channel.

30. The method of Claim 23, wherein the add/drop nodes are operable to transmit substantially the same traffic over each of the first and second optical fiber rings.